Inventions & Innovation Project Abstract

Oxide Dispersion Strengthened Iron Aluminide by CVD

Current coal power steam cycles are limited to 550º C due to materials limitations with current alloys. A 5% increase in energy efficiency can be achieved in combustion systems by increasing steam cycle temperature and pressures. Powdermet, Inc. is developing and prequalifying oxide dispersion strengthened iron aluminide boiler tubes and coatings for use in IGCC and PFBC combustion systems by Fe/Al/Al_2O_3 CVD coated Powders. This will be accomplished using the innovative new powder metallurgy process enabling precise, nanolevel control over dispersoid size and distribution, grain size, and aluminide composition.

In a previous program, the feasibility of producing alumina dispersed Fe-Al-Cr-B is demonstrated. In this program an expanded series of alloys and designer microstructure will be produced as mill product and hot gas filter elements. These boiler tube and filter elements will be exposed to simulated carbonizer and PFBC conditions leading to a materials solution to these energy system challenges. In addition to basic alloy and coating development, Powdermet will address fabricating and joining issues. The program will also develop a new thermal spray technique leading to dense well bonded corrosion and oxidation resistance coatings.

As a result, this program will lead to improved boiler tubes for carbonizer (IGCC) and PFBC combustion systems, improved hot gas filter for combined cycle hot gas clean-up, a dense thermal spray coating, and a new powder manufacturing process offering advantage over mechanical alloying and rapid solidification or other processes. Successful development iron aluminide will lead to a 4-5% increase in conversion efficiency.

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